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# मानक

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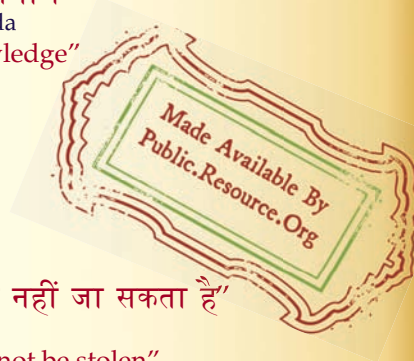
IS 11313 (2007): Hydraulic Power Sprayers [FAD 21: Farm Implements and Machinery]



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“Knowledge is such a treasure which cannot be stolen”



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भारतीय मानक  
द्रव शक्ति चालित छिड़काव यन्त्र — विशिष्टि  
( पहला पुनरीक्षण )

*Indian Standard*  
**HYDRAULIC POWER SPRAYERS — SPECIFICATION**  
( *First Revision* )

ICS 65.060.40

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**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

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**Price Group 5**  
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## FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Irrigation Systems, Farm Implements and Machinery Sectional Committee had been approved by the Food and Agriculture Division Council.

Manually-operated sprayers for which a series of Indian Standards have been compiled, are gradually being replaced by the power-operated sprayers, since, they perform the job quickly and the cost of operation is low. The power-operated sprayers are based on either hydraulic or pneumatic energy for atomizing and spraying of the liquid. The requirements of the power-operated pneumatic sprayer has been covered in IS 7593 (Part 1) : 1986 'Specification for power-operated pneumatic sprayer-cum-duster: Part 1 Knapsack type'.

Hydraulic power sprayers may be fitted with any of the following types of pumps, namely, piston type, plunger type, roller vane type, diaphragm type, gear type and centrifugal type. This standard covers the requirements of sprayer fitted with piston type and roller vane type pump.

This standard was first published in 1985. This revision has been taken up to following reasons:

- a) To incorporate modifications in material, constructional and performance requirements and their methods of test in view of advancement in technology.
- b) To include the methods of test covered in IS 8548 : 1977 'Test code for power-operated hydraulic sprayer' to make the standard comprehensive and user friendly. Hence IS 8548 stands withdrawn.
- c) To update the standard.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

# Indian Standard

## HYDRAULIC POWER SPRAYERS — SPECIFICATION

( First Revision )

### 1 SCOPE

This standard specifies material, performance and other requirements of hydraulic power sprayers fitted with either piston/plunger type or roller vane type pump.

### 2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	Title
292 : 1983	Lead brass ingots and castings (second revision)
325 : 1996	Specification for three phase induction motor (fourth revision)
1570 (Part 2/ Sec 1) : 1979	Schedule for wrought steels: Part 2 Carbon steels (unalloyed steels), Section 1 Wrought products (other than wires) with specified chemical composition and related properties
2643 : 2005/ ISO 228-1 : 2000	Pipe threads where pressure — Tight joints are not made on the threads — Dimensions, tolerance and designation (third revision)
3652 : 1995	Foot Sprayer — Specifications (fourth revision)
7201 (Part 1) : 1987	Methods of sampling for agricultural machinery and equipment : Part 1 Hand-tools and hand-operated/animal-drawn equipment (first revision)
7347 : 1974	Specification for performance of small size spark ignition engines
10134 : 1994	Methods of tests for manually operated sprayer

### 3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

### 3.1 Cycle

#### 3.1.1 Piston/Plunger Type

**3.1.1.1 Single acting** — One up and down stroke in one revolution of the crank shaft.

**3.1.1.2 Double acting** — One up and down stroke of all pistons/plungers in one revolution of the crank shaft.

**3.2 Direction of Rotation** — Direction of rotation of a roller vane type pump when viewing from the driven end of the shaft. It may be either clockwise or anti-clockwise.

**3.3 Hydraulic Spraying** — Spraying performed by the use of hydraulic energy.

**3.4 Hydraulic Sprayer** — A sprayer in which the pressure is built up by the direct action of the pump on the liquid spray material.

**3.5 Hydraulic Power Sprayer** — A sprayer used for hydraulic spraying, driven by an engine, a motor or a tractor, by high and low volume spraying technique.

**3.6 Overall Volumetric Efficiency** — It is the ratio of the pump output to pump input.

**3.7 Piston/Plunger Displacement** — The volume displaced by the piston/plunger during one stroke.

**3.8 Positive Displacement Pump** — A pump in which energy is periodically added by application of force to one or more moving parts of pump to increase the pressure of fluid.

**3.9 Pressure Chamber** — A component to even out the fluctuations of the liquid pressure and induce uniform flow of the liquid.

NOTE — In some design, the piston rod is not provided. In such cases, pressure chamber helps in the movement of the piston.

**3.10 Pump Output** — Volume of liquid discharge by a pump per unit of time.

#### 3.11 Pump

**3.11.1 Piston/Plunger Pump** — A volumetric pump in which the flow of the liquid is achieved by the movement of piston in cylinder.

**3.11.2 Roller Vane Pump** — A volumetric pump in which the flow of the liquid is achieved by the radial displacement of rollers placed in a rotor and in contact with an eccentric stator.

**3.12 Rated Pressure** — The working pressure at which the pump is recommended for continuous duty.

**3.13 Rated Speed** — The maximum speed at which the pump is recommended for continuous duty.

**3.14 Rectangular Distribution Curve** — The rectangular form with an even spray deposit across the width.

**3.15 Roller** — The movable seating elements which generally move radially inward and outward with centrifugal force to maintain fluid seals between the open-to-inlet and open-to-outlet during the operation of the pump.

**3.16 Row Angle** — The angle between the nozzle pointing forward and the nozzle pointing backward when fitted on a boom.

**3.17 Spray Angle** — The angle subtended at the final orifice by the edges of the spray pattern.

**3.18 Spray Pattern** — The area and shape of spray deposit produced by a spray nozzle at a given distance from the nozzle orifice.

**3.19 Triangular Distribution Curve** — A triangular form raising regularly to peak in the centre.

**3.20 Stroke** — The maximum travel of piston/plunger in one direction.

**3.21 Volumetric Efficiency**

**3.21.1 Piston/Plunger Pump** — It is the ratio of the actual volume of the spray fluid discharged in one cycle at rated pressure and rated speed to the piston/plunger displacement in the same cycle.

**3.21.2 Roller Pump** — It is the ratio of the actual volume of spray fluid discharged at rated pressure and rated speed per unit time to the discharge per unit time at no load and rated speed.

**4 MATERIALS**

**4.1** The recommended material for the construction of various components is given in Table 1. Brass casting components shall conform to chemical composition of IS 292 (Grade to be declared by the manufacturer). Some of the relevant Indian Standards for constructional materials are given in Annex A for guidance.

**4.2** All metallic parts coming in contact with the

**Table 1 Materials of Construction of Various Components**  
(Clauses 4.1 and 4.3)

Sl No. (1)	Components (2)	Materials (3)	Indian Standard (4)
i)	Pump cylinder	Brass Stainless steel	
ii)	Pressure chamber	Brass Stainless steel	
iii)	Piston rod	Stainless steel	
iv)	Piston or plunger	Gunmetal Stainless steel Plastics Rubber Vegetable tanned leather Chrome tanned leather	
v)	Spreader	Brass Stainless steel Plastics	
vi)	Valve assembly	Brass Stainless steel Plastics	

Table 1 (Concluded)

SI No. (1)	Components (2)	Materials (3)	Indian Standard (4)
vii)	Roller pump shaft	Stainless steel	
viii)	Pump rollers	Nylon filled with lead	
ix)	Pressure regulators	Brass Stainless steel	
x)	Suction strainer	Brass Stainless steel Plastics	
xi)	Strainer body	Brass Plastics	
xii)	Gasket	Rubber Polyvinyl chloride (PVC) Leather Fibre	
xiii)	Spray nozzles	Brass Stainless steel	
xiv)	Spray boom	Mild steel Galvanized iron Braided rubber	
xv)	Hose	Synthetic rubber Polyvinyl chloride (PVC)	
xvi)	Tank	Galvanized iron Brass Fibre glass reinforced plastics Plastics	
xvii)	Pipe for agitator	Galvanized iron Brass Polyvinyl chloride (PVC)	
xviii)	Piston (bucket) screw	Brass Stainless steel	
xix)	Crank case	Aluminium alloy	
xx)	Roller pump body	Nickel resistant cast iron	
xxi)	Roller pump and plate	Nickel resistant cast iron	
xxii)	Roller pump rotor	Nickel resistant cast iron	
xxiii)	Piston pump crank shaft	Carbon steel [see C 40/C 55 of IS 1570 (Part 2/Sec 1)]	
xxiv)	Pump inlet port end fitting	Brass	
xxv)	Piston rod guide	Brass Aluminium alloy Gunmetal Nylon	
xxvi)	Connecting rod	Carbon steel [see C 40 of IS 1570 (Part 2/Sec 1)]	
xxvii)	Gudgeon pin	Carbon steel [see C 40 of IS 1570 (Part 2/Sec 1)]	
xxviii)	Big end bearing	Steel coated with tin base White metal	
xxix)	Small end bush	Gunmetal	

pesticide should preferably be of the same material to minimize bimetallic corrosion.

4.3 The material used for different components shall be declared by the manufacturer. All the components mentioned in the Table 1 may not be present in a particular sprayer.

## 5 CONSTRUCTION REQUIREMENTS

5.1 The tank, if provided, its capacity shall be not less than 100 litres. The tank capacity shall be declared by the manufacturer.

5.1.1 The tank when filled up to its total capacity, the tank shall not show any sign of leakage and shall not buckle.

### 5.2 Filling Hole

A filling hole of suitable diameter shall be provided on top of the tank.

5.2.1 The hole shall be covered with a tightly fitted cap.

5.2.2 The suitable drain plug shall be provided at the bottom of the tank for cleaning.

### 5.3 Lubrication

5.3.1 A suitable arrangement shall be provided for lubricating the moving parts and shall be indicated by the manufacturer in the manual.

5.3.2 The pump shaft of roller vane type displacement pump shall be supported by permanently lubricated bearings.

### 5.4 Spreader

If provided, shall be able to hold the piston in its position without distortion against the wall of the pump cylinder.

### 5.5 Driving Shaft

A suitable driving shaft shall be provided so that either it can be coupled directly to the prime mover or through a pulley.

### 5.6 Suction Spout

There shall be one suction spout having serrated nipple or threaded connection. In case of threaded connection external thread size, minimum of designation G½ B [see IS 2643].

NOTE — The measurement of the thread size shall be done by the gauges and not by measuring absolute dimensions.

### 5.7 Delivery Spout

There may be two delivery spouts having threaded

connection. The external thread size shall be not less than the designation of G¼ B [see IS 2643]. The engaged length of the thread shall be not less than 6 mm (see also Note under 5.6).

### 5.8 Overflow Pipe

An overflow pipe of suitable diameter and length shall be provided.

### 5.9 Pump Inlet/Outlet Port

This may be integral or separately attached to pump body. The thread size of inlet/outlet port shall conform to thread size specified in [see IS 2643]. The engaged length of the thread shall be not more than 8 mm.

### 5.10 Regulator cum Relief Valve

A pressure regulator or valve to adjust the working pressure up to rated pressure shall be provided. It shall be able to release all or part of the liquid delivered by the pump to be returned to the tank at set pressure. It shall not allow the increase of pressure by more than 25 percent of maximum pressure declared by the manufacturer.

### 5.11 Pressure Gauge

A suitable pressure gauge/pressure indicator having full scale reading not exceeding two and half times and not less than 1.5 times the rated pressure shall be provided.

### 5.12 Pressure Dampner

A pressure dampner may be provided at the option of the purchaser to facilitate easy reading of pressure.

### 5.13 Gaskets

The gaskets, wherever provided shall withstand the test prescribed in 7.4 of IS 10134.

### 5.14 Delivery Hose

If provided with couplings shall have suitable diameter and length as agreed to between the purchaser and the supplier.

#### 5.14.1 Hose Connections

The hose connections for threaded type and nipple type connections shall be nut-nipple and clamp type and clamp type respectively.

5.14.2 The metallic nut if provided shall have the internal thread size, minimum of designation G¼ B [see IS 2643 (Part 1)]. The clamp shall consist of ferrule or clip. Other thread sizes if used shall be of standard pipe threads [see IS 2643].

NOTE — The types of fastening shall match with the spraying system to be used.

**5.14.3** The hose and hose connection shall withstand the test prescribed in 7.2 of IS 10134.

#### **5.15 Nozzles**

Unless otherwise specified by the purchaser, the nozzle shall conform to the requirement of Annex F of IS 3652.

**5.16** The engine and electric motor shall conform to the requirements as given IS 7347 and IS 325 respectively.

**5.16.1** The exhaust outlet of the engine shall be so positioned that the smoke does not directly affect the operator or crop. A guard shall be provided on or near the exhaust pipe for the protection of the operator.

**5.17** The fuel and chemical discharge controls shall be in easy access of the operator.

**5.18** Air pressure chamber shall withstand the test prescribed in 8.7 without any deformation or damage.

### **6 PERFORMANCE REQUIREMENTS**

#### **6.1 Discharge Rate/Suction Capacity**

When tested in accordance with the method given in 8.3, the pump shall be capable of discharging/sucking a minimum of 8 000 ml water per minute at its rated speed and rated pressure.

**6.1.1** The discharge rate/suction capacity shall be declared by the manufacturer.

#### **6.2 Volumetric Efficiency**

**6.2.1** When determined in accordance with 8.4.1, the volumetric efficiency of piston/plunger type pump shall be minimum 80 percent.

**6.2.2** The volumetric efficiency requirement for roller vane type pump shall be minimum 80 percent.

NOTE — Members are requested to suggest a minimum value of volumetric efficiency for roller vane pump that should be specified in this standard otherwise it will not be possible to finalize this standard.

#### **6.3 Power Requirement**

When tested in accordance with the method given in 8.5, pump shaft power requirement shall not be more than that of the value declared by the manufacturer.

#### **6.4 Maximum Achievable Pressure**

When tested in accordance with the method given in 8.7, maximum achievable pressure shall not be less than that of the value declared by the manufacturer.

#### **6.5 Endurance Test**

Sprayer shall withstand the test endurance test specified in 8.8.

### **7 OTHER REQUIREMENTS**

**7.1** Each sprayer shall be provided with parts catalogue and manual giving detailed information about sprayer, engine, its rated speed along with operational and maintenance instructions and safety precautions.

**7.2** Each sprayer shall be provided with a set of necessary tools, suction strainer having aperture size of 300  $\mu$ m to 425  $\mu$ m and a measuring jar for lubricating oil.

**7.3** On the option of the purchaser, the following accessories shall be supplied.

- a) A set of spray nozzles (conforming to Annex F of IS 3652) for different discharge rates, and
- b) Spray gun conforming to Annex E of IS 3652.

### **8 METHODS OF TEST**

#### **8.1 Checking of Specification**

The specification given by the manufacturer shall be checked and reported on the form given in Annex B.

#### **8.2 Checking of Material**

The material of construction of different component of the sprayer shall be observed and reported as given in.

#### **8.3 Discharge Rate**

**8.3.1** The discharge rate per minute shall be measured at maximum and minimum working pressures, specified by the manufacturer by suitably collecting the test liquid from delivery outlet and by-pass outlet. The discharge rate shall be measured in at least four equal steps between the lowest and the highest pressure. In case the pressure values are not specified the maximum pressure shall be not more than 500 kPa and minimum not less than 50 kPa. During the test period, the pressure shall be kept constant and the deviation, if any shall be kept within  $\pm 20$  percent. The tank shall be filled with clean water and the prime mover shall be operated at a speed specified by the manufacturer. The discharge of water from delivery spout and by-pass outlet is to be collected into a receiving vessel. The measuring period should be at least  $60 \pm 1$  s.

**8.3.2** At each pressure setting, the test shall be repeated for a minimum of four times.

**8.3.3** The average value of discharge for each pressure shall be obtained and recorded as liters per minute.

**8.3.4** The data shall be recorded according to Annex D.

## 8.4 Volumetric Efficiency of Pump

### 8.4.1 Piston/Plunger Type Pump

The actual volume of water in one cycle shall be computed from the average measured discharge (see 8.3.3).

**8.4.1.1** The piston displacement at rated pressure shall be computed by measuring the inner diameter of the pump cylinder and length of the one stroke.

**8.4.1.2** The quotient of the values obtained in 8.4.1 and 8.4.1.1 will give the volumetric efficiency.

### 8.4.2 Roller Vane Type Pump

The discharge of water in one minute at no load shall be collected and measured in accordance with the method given in 8.3. The pump shaft speed in revolution per minute shall also be recorded.

**8.4.2.1** The volumetric efficiency in percentage shall be calculated by the following formula:

$$n_v = \frac{Q}{Q_1} \times \frac{N_1}{N} \times 100$$

where

$n_v$  = volumetric efficiency;

$Q$  = discharge of water at rated pressure, in litre/min;

$Q_1$  = discharge of water at no-load, in litre/min;

$N_1$  = pump speed at no-load, in rev/min; and

$N$  = pump speed at rated pressure, in rev/min.

## 8.5 Power Requirement

**8.5.1** A dynamometer shall be fitted between the prime mover and the main shaft of the sprayer. The dynamometer shall be so fitted that there is no appreciable angularity at the joints. The angularity, if present shall not exceed 7°. In case of electric motor, energy meter should be fitted. A pressure gauge at discharge port shall also be connected.

**8.5.2** The sprayer shall be operated at specified speed with tolerance of 5 percent and at four pressure stages covering maximum and minimum. The liquid shall be collected in receiving vessel for a period of  $60 \pm 1$  s. The dynamometer or energy meter reading and pressure gauge reading shall also be taken during the collection of liquid.

**8.5.3** On the basis of above information, power required to operate the sprayer shall be calculated.

**8.5.4** The data shall be recorded according to C-3.

## 8.6 Agitation Performance

**8.6.1** For roller vane type pump and piston/ plunger type pump, the working pressure shall be 500 kPa and 1 000 kPa  $\pm$  2.5 percent.

**8.6.2** For the test, 2 kg of tracing material consisting of 90 percent wettable sulphur powder having grain size in at least one-third of the powder between 5  $\mu$ m and 40  $\mu$ m and in the rest less than 5  $\mu$ m, shall be used. It shall be suspended in about 2.5 litres of water per kilogram of sulphur. The mixture of sulphur and water shall be left for 2 h and then agitated until it appears like a soup. The spray liquid shall then be added while agitating the mixture.

**8.6.3** One litre of test liquid shall be tapped and the initial concentration shall be determined by means of evaporation.

### 8.6.4 Mixing Time

After the addition of the tracing material the test liquid shall be left for 2 h. The test shall be carried out at specified revolutions and at working pressure of 500 kPa  $\pm$  2.5 percent or 1 000 kPa  $\pm$  2.5 percent, as the case may be, without discharge of liquid. Samples of the liquid shall be tapped immediately after the operating device. A total of 10 samples shall be tapped at intervals of 30 s. The first collection shall be made after 30 s of the start. The concentration of the samples collected shall be given in a table or illustrated graphically as a function of time.

### 8.6.5 Effectiveness of Agitation

The testing shall be started after a period of mixing (see 8.6.3) which ensures that the spraying liquid is as homogeneous as possible.

**8.6.5.1** The sprayer shall be operated at its specified revolution and pressure by discharging the total content of the tank. When 10 percent of the liquid is discharged, a sample shall be tapped. At intervals of 10 percent, samples shall be tapped until the tank is empty. The concentration of the samples collected shall be given in a table or illustrated graphically as a function of time.

**8.6.5.2** At the end of the test, the sulphur deposit in tank shall be collected and shall be reported as percentage of quantity originally added.

**8.6.6** The observations shall be recorded according to C-4 or illustrated graphically.

## 8.7 Pressure Adjustment

**8.7.1** The sprayer fitted with pressure gauge shall be operated at four stages of pressure covering the minimum and maximum, and at specified speed for minimum of 30 min. At every pressure setting, the fluctuation of the pressure shall be recorded in C-5.

**8.7.2** The air pressure chamber shall be tested separately at a pressure 2.5 times the normal working pressure or 1.5 times the maximum working pressure whichever is more for a minimum of 30 s, to see the pressure resistance of the chamber.

## 8.8 Endurance Test

**8.8.1** The sprayer shall be operated at specified normal working pressure and speed continuously for a period of minimum 50 h. The discharge shall be collected for a period of 1 min after 15 min of running for the first time. After first collection, subsequent collection of the discharge shall be done for the period of 1 min after every 8 h run. After the test the sprayer shall conform the following requirements:

**8.8.1.1** The sprayer shall not show any leakage, deformation or breakdown and any undue knocking or rattling sound.

**8.8.1.2** Variation in discharge rate between first and last observation shall not be more than  $\pm 5$  percent.

**8.8.2** The observations shall be recorded according to C-7.

## 9 WORKMANSHIP AND FINISH

**9.1** All the components of the sprayer shall be free from burrs, pits and other visual defects which may be detrimental for their use.

**9.2** The exposed metallic parts shall have a protective coating to prevent surface deterioration.

## 10 MARKING AND PACKING

### 10.1 Marking

Each sprayer shall be marked with the following particulars :

- a) Manufacturer's name or his registered trade-mark; and
- b) SI No. and batch or code number.

### 10.2 BIS Certification Marking

Each Sprayer may also be marked with the Standard Mark.

**10.2.1** The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

### 10.3 Packing

Unless otherwise agreed to between the purchaser and the supplier, each sprayer shall be first packed in polyethylene bag and then a wooden case to avoid damage in transit.

## 11 SAMPLING FOR LOT ACCEPTANCE

Unless otherwise agreed to between the purchaser and the supplier, sampling of the sprayer for lot acceptance shall be done in accordance with 3 of IS 7201 (Part 1).

## ANNEX A (Clause 4.1)

### LIST OF RELEVANT INDIAN STANDARDS FOR MATERIALS OF CONSTRUCTION

IS No.	Title	IS No.	Title
277 : 1992	Galvanized steel sheets (plain and corrugated) ( <i>third revision</i> )	733 : 1983	Wrought aluminium and aluminium alloy bars rods, and sections (for general engineering purposes ) ( <i>second revision</i> )
292 : 1983	Leaded brass ingots and castings ( <i>second revision</i> )	737 : 1986	Wrought aluminium and aluminium alloys, sheet and strip (for general engineering purposes) ( <i>second revision</i> )
407 : 1981	Brass tube for general purposes ( <i>third revision</i> )	738 : 1994	Wrought aluminium and aluminium alloys drawn tube for general engineering purposes ( <i>second revision</i> )
410 : 1977	Cold rolled brass sheet, strip and foil ( <i>third revision</i> )	739 : 1992	Wrought aluminium and aluminium
617 : 1994	Aluminium and aluminium alloy ingots and castings for general engineering purposes ( <i>second revision</i> )		

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
	alloy wire (for general engineering purposes ) ( <i>second revision</i> )	4413 : 1981	Brass wires for general engineering purposes ( <i>first revision</i> )
1741 : 1960	Latex foam rubber products	6603 : 1972	Stainless steel bars and flats
2062 : 1992	Structural steel (standard quality) ( <i>fifth revision</i> )	6911 : 1992	Specifications for stainless steel strip and plate ( <i>first revision</i> )
2954 : 1978	Vegetable tanned leather for belting ( <i>first revision</i> )	7608 : 1987	Phosphor bronze wires for general engineering purposes ( <i>first revision</i> )
4170 : 1967	Brass rods for general engineering purposes		

**ANNEX B**  
(*Clause 8.1*)

**SPECIFICATION SHEET**

**B-1 GENERAL**

- a) Make
- b) Model
- c) Type
- d) Serial number
- e) Manufacturer

**B-2 PRIME MOVER**

- a) Make
- b) Type
- c) Model
- d) Power rating
- e) Country of origin

**B-3 CYLINDER**

- a) Number
- b) Disposition
- c) Bore/stroke
- d) Capacity
- e) Compression ratio
- f) Cylinder lining

**B-4 FUEL AND IGNITION SYSTEM**

- a) Fuel feed
- b) Carburettor
- c) Ignition
- d) Magneto contact breaker point gap
- e) Size of spark plug
- f) Electrode gap of spark plug
- g) Capacity of fuel tank
- h) Ignition timing

**B-5 AIR CLEANER**

- a) Type
- b) Location

**B-6 LUBRICATION**

- a) Type
- b) Ratio of petrol and mixing oil
- c) Grade of mixing oil

**B-7 COOLING SYSTEM**

- a) Type
- b) Blower

**B-8 TYPE OF STARTING SYSTEM**

**B-9 TANK**

- a) Size
- b) Capacity
- c) Method of mounting
- d) Maximum sustained pressure without leakage
- e) Safe pressure for spraying operation

**B-10 FRAME**

- a) Type
- b) Diameter of pipe

**B-11 BLOWER ASSEMBLY**

- a) Type of impeller
- b) Diameter of impeller
- c) Number of vanes
- d) Details of drive
- e) Capacity, in m<sup>3</sup>/s
- f) Air velocity at rated engine speed, in m/s

**B-12 AIR DEFLECTOR**

- a) Type
- b) Length of deflection hose
- c) Ease of adjustment

**B-13 AGITATING DEVICE**

- a) Location
- b) Type
- c) Method of working
- d) Method of pressure regulation

**B-14 NOZZLE**

- a) Type
- b) Size of nozzle and discharge:

<i>Nozzle No.</i>	<i>Discharge</i>
1	
2	
3	
4	

**B-15 MOUNTING ARRANGEMENT****B-16 ACCESSORIES (FOR OPERATOR'S SAFETY AGAINST PESTICIDES)****B-17 OVERALL DIMENSIONS**

- a) Length (with hose)
- b) Length (without hose)
- c) Width
- d) Height

**B-18 TOTAL MASS**

- a) With all accessories and without fuel and chemical, and
- b) With all accessories and fuel and chemical tank full.

**NOTES**

1 The item which is not applicable in a particular sprayer should be crossed while filling.

2 If any other items are provided their detail should be filled in.

**ANNEX C**

(Clauses 8.5.4, 8.6.6, 8.7.1 and 8.8.2)

**DATA SHEET — PERFORMANCE TESTS****C-1 DATE****C-2 ATMOSPHERIC CONDITIONS**

- a) Temperature
- b) Relative humidity
- c) Pressure

**C-3 PUMP EFFICIENCY**

<i>Test No.</i>	<i>Pressure Gauge Reading</i>	<i>Energy/Meter or Dynamometer Reading</i>	<i>Speed rev/kW</i>	<i>Required Power kW</i>	<i>Discharge litre/min</i>
(1)	(2)	(3)	(4)	(5)	(6)
1)					
2)					
3)					
4)					

C-4 DATA FOR AGITATION

- a) Initial concentration
- b) Mixing time and effectiveness

<i>Sample No.</i>	<i>Concentration</i>
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

- c) Quantity of tracing material remains in tank after operation.

C-5 DATA FOR PRESSURE ADJUSTMENT

- a) Observations

<i>Working Pressure</i>	<i>Fluctuation Range</i>	<i>Pressure Drop</i>	<i>Ratio</i>

- b) Resistant of pressure – Yes or No

C-6 VISUAL OBSERVATION

- a) Easiness of transporting
- b) Easiness of operating
- c) Proper tightness of fasteners
- d) Any marked vibration
- e) Any undue knocking or rattling sound
- f) Any leakage of liquid or oil
- g) Any deformation or breakdown
- h) Marked wear of any component
- j) Any other observation

C-7 ENDURANCE TEST

C-7.1 Quantity of the Liquid Collected

- a) First collection
- b) Second collection
- c) Third collection
- d) Fourth collection
- e) Fifth collection
- f) Sixth collection
- g) Last collection

C-7.2 Percentage Variation of Discharge from First to Last Collection

C-7.3 Visual Observations (*see* C-6)

ANNEX D  
(Clause 8.3.4)

DATA SHEET — LONG RUN TEST

D-1 TOTAL RUNNING TIME

D-2 QUANTITY OF THE LIQUID COLLECTED

- a) First collection
- b) Second collection
- c) Third collection
- d) Fourth collection

- e) Fifth collection
- f) Sixth collection
- g) Last collection

D-3 PERCENTAGE VARIATION OF DISCHARGE FROM FIRST TO LAST COLLECTION

D-4 VISUAL OBSERVATIONS (*see* C-6)

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## BUREAU OF INDIAN STANDARDS

### Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002

Telephones: 2323 0131, 2323 3375, 2323 9402

website : [www.bis.org.in](http://www.bis.org.in)

### Regional Offices:

#### Telephones

Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	{ 2323 7617 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi KOLKATA 700054	{ 2337 8499, 2337 8561 2337 8626, 2337 9120
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